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ABSTRACT

This study hypothesized that: the mode of instruction used at a zoo exhibit and the familiarity (low, medium, high) of an animal to visitors interacts with the amount of knowledge they demonstrate about the animal; a relationship exists between visitors' demonstrated knowledge of an animal of a given level of familiarity and attitude toward protection of the animal; an interaction exists between instructional mode under which information is acquired and degree to which a positive attitude toward an animal is exhibited; and a correlation exists between familiarity-level of an animal and positive attitudes about the animal. Zoo visitors (N=720), aged 16 or older, completed questionnaires consisting of 13 dichotomous-choice items. Data were collected on four consecutive weekends at the Los Angeles zoo. Results, among others, indicate that: visitors learned more with signs or docents (Zoo Teachers); the more familiar visitors are with an animal the more knowledge they demonstrate about that animal; and that docents were found to have no significant impact on visitor knowledge in high/medium familiarity groups, having the greatest impact on visitors when their presentations are for animals of very low familiarity. In addition, attitude was found to be the best predictor of a visitor's knowledge. (JN)

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Dosage versus Distribution:
The Support of Docents on Zoo Visitors'
Acquisition of Knowledge

by

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and

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1982

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I would like to acknowledge the docents of the Greater Los Angeles Zoo Association for their assistance in conducting this study. In addition, I would like to thank Lora LaMarca, Curator of Education, Nancy Carnes, Assistant Curator of Education, as well as the staff of Animal Services for their instrumental role in making this study possible.

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Introduction

One of the most startling features in the history of museums is the lack of systematic evaluative literature concerning the impact museums have on their audiences (Grove, 1968). One reason for this lack may be the difficulty of assessing learning in informal settings. An attempt can still be made, however, to manipulate certain factors thought to have some influence on what an individual learns. This paper is concerned with "living museums", or zoos, and the impact they may have on the general public's knowledge about animals. In addition, the question is raised as to whether there is a relationship between an individual's knowledge of an animal and their willingness to preserve it.

Living museums differ from more traditional museums in that the collections they maintain are mortal. Due to this differentiating characteristic, a significant concern of living museums is the preservation of exhibited species in at least two ways. The first involves the development of breeding programs at the zoo. The second involves the development of an awareness on the part of zoo visitors that their efforts could contribute to the preservation of a species in its natural habitat. Zoos are acutely aware that the collections they maintain and exhibit can only be provided for in the future if their audience, the general public, sees some value in preserving those species represented in the zoo.

When compared with other research in the social sciences, relatively few studies are available concerning the educational value of zoo programs that are systematic in nature. While studies have been done on the effects of educational courses at the zoo (Gennaro, 1980) such formalized courses do not represent the average zoo visitor's experience. Approaches that

stimulate children through "hands on" method of study have been written up as being highly successful and yet may provide no other background data other than the author's observation (Lustig, 1979; Zipko, 1980).

While previous studies have focused on the overall experience of visitors to museums or zoos (Anderson, 1968; Birney, 1980; Wittlin, 1968; and Wolf, 1968), few have systematically examined whether the information the visitor obtains affects his or her attitude toward a specific topic.

Formal studies in psychology demonstrate that changes in attitude and greater interest in the subject matter are correlated with increased participation (Sherif and Sherif, 1967; Sherif, Sherif, and Nebergall, 1965; Triandis, 1971; and Watt, 1967).

How information is presented to the individual can affect an individual's attitude. Reactions to unidentifiable objects have been shown to be less intense than those to identifiable objects (Dillahay, 1966). Pre-existing biases are of utmost importance in determining how new information is evaluated (Salencik, 1974; Collins, 1974; and Wyer, 1977). Wyer (1977) found that individuals were more receptive to information if they were exposed to it in favorable surroundings. Wolf (1978) found that labels are well attended to in zoos although zoo visitors indicated a preference for a guide. This may be explained in part by studies conducted by McGuire (1960; 1964) in which he showed that people require both arguments for and against a truism prior to adopting a position in which they can effectively resist attack. In the effort to affect an individual's attitude, not only must information be made available but it may be vital that they be given the opportunity to discuss the pros and cons.

Such empirical investigations tend to provide information to subjects in written form or on tape. The way in which information is communicated

to visitors in a zoo or museum goes beyond written description. Visitors gain knowledge, we assume, by viewing exhibited items. Yet we must ask ourselves how effective a means of instruction an exhibit is. Exhibits may be thought of as three-dimensional pictures (Fleming, 1979). However, Booher (1975) demonstrated that instruction using pictorial means alone results in less learning than when text accompanied pictures.

Putting the above findings together, we can observe that few studies have systematically tested visitors for knowledge we assume they gain from viewing a zoo exhibit. Formal empirical studies in psychology and education, however, suggest that the mode of instruction used and a subject's previous familiarity with the topic will affect what the subject learns as well as their attitude towards it.

In this study it was hypothesized that the mode of instruction used at an exhibit and the familiarity of the animal to the visitor interacts significantly with the amount of knowledge a visitor demonstrates about the animal. Secondly, a significant relationship was expected to exist between the visitor's demonstrated knowledge of an animal of a given level of familiarity and their attitude towards protection of that animal. The third hypothesis to be tested was whether there is significant interaction between the mode of instruction under which the visitor acquired their information and the degree to which they exhibit a positive attitude towards an animal of a given familiarity level. Finally, a significant linear correlation between the familiarity of the animal and the degree to which visitors exhibit a positive attitude about an animal of a given familiarity level was thought to exist.

Methods

Subjects and Materials. 720 zoo visitors participated in the study. Participants were 16 years of age or older. All data were gathered with the use of questionnaires composed of thirteen dicotomous-choice items. Ten of these items were constructed to test knowledge for each of six animals based on the content of the zoo signs. Three items intended to assess visitor attitude toward the test animal were randomly distributed among the ten knowledge items. The attitudinal items asked visitors if they felt that the given animal (1) had enough space allotted to it for survival in the wild, (2) merited preservation efforts by organizations outside of the zoo, and (3) merited preservation efforts by the zoo itself in the way of breeding programs.

Located on the back of each questionnaire sheet was an identical set of inquiries concerning (1) the size of the group in which the visitor was visiting the zoo, (2) how frequently s/he visits the zoo, (3) whether or not s/he was a member of the Greater Los Angeles Zoo Association, and (4) his/her ethnic background. Each inquiry was in the form of a multiple-choice item.

In addition, lecturing docents prepared a Type of Inquiry sheet indicating the kinds of questions that they received from the public after each lecture.

Design and Procedure. The design was a completely crossed analysis of variance examining 4 Modes of Instruction (Normative vs. No-Instruction vs. Sign vs. Docent) by 3 Levels of Familiarity (Low vs. Medium vs. High). Highly Familiar animals were easily identifiable by visitors and fairly commonplace. Participants may have had personal experience with these

animals and have probably read or heard about them throughout their lives (e.g. coyote, porcupine, rabbit). The raccoon and badger represented the High Familiarity animals in this study. Animals of Medium Familiarity are readily identifiable by visitors. Visitors have probably not had personal experience with these animals although they may have been exposed to television shows or books about them (e.g. lion, gorilla, rhinoceros). The chimpanzee and polar bear were the Medium Familiarity animals used in this study. Low Familiarity animals were not readily identifiable and little known to the general public. The patagonian cavy and mountain tapir were chosen to represent this category.

Data were collected on four consecutive weekends at the Los Angeles Zoo. Normative group data were gathered by asking visitors to complete the questionnaires prior to their entry into the park. No-Instruction group data were obtained after visitors viewed an exhibit unaccompanied by either a sign or docent. Sign participants viewed the same exhibits accompanied by an informative sign. Docent group participants heard a trained GLAZA zoo docent convey the content of the zoo sign verbally, as well as answer any questions. Signs were concealed from view for all but the Sign treatment group.

Visitors were not cued that they would be tested for their memory about the animal until after they had (1) viewed the animal, and (2) were in the process of moving on to another exhibit. Visitors were then approached by docents as they left the exhibit site and asked to participate in the study. They were instructed to leave blank any item of which they were unsure and to fill out the information on both sides of the questionnaire. Docents were available to answer any procedural questions.

Finally, under the Docent condition, docents giving lectures logged the number and type of questions they were asked on their Type of Inquiry sheets.

Results

Questionnaires were scored for the number of correct responses. Since guessing was discouraged by instructions from docents, all unanswered items were scored as incorrect.

Our first concern was to establish that the animals utilized in the study did indeed represent three distinct levels of familiarity. A one-way analysis of variance for Knowledge scores revealed a significant difference among animals ($F(5,355)=32.556$; $MSe=5.667$; $p<.0001$). A Newman-Kuels post hoc comparison (See Table 1) verified that the badger and raccoon means were essentially equal and were significantly higher than those of the other animals. Similarly, chimpanzee and polar bear mean scores were the same and were significantly higher than those of the mountain tapir and the patagonian cavy. Due to these results, all subsequent analyses performed considered only the Level of Animal Familiarity and not each specific animal.

Insert Table 1

The Knowledge score means and standard deviations for Mode of Instruction by Level of Animal Familiarity are shown in Table 2.

A two-way analysis of variance for Knowledge scores yielded significant main effects for Mode of Instruction and for Level of Animal Familiarity as well as for the interaction of the two (See Table 3).

A Newman-Kuels post hoc multiple comparison procedure was performed on the means for all effects to determine their sequence. All means sequences reported in this section are the result of this procedure. When Mode of Instruction alone was considered ($F(3,708)=23.342; MSe=5.167; p<.0001$), Docents produced the highest mean Knowledge scores followed by Signs, No-Instruction and Normative, respectively. For the three Levels of Animal Familiarity ($F(2,348)=65.29; MSe=$; $p<.001$), Knowledge scores means were highest for the High Familiarity treatment group and lowest for the Low Familiarity treatment group with the Medium Familiarity means falling between the two (See Table 4).

Insert Tables 2-4

Of special interest is the significant interaction between the Mode of Instruction and Level of Familiarity ($F(6,348)=4.111; MSe=10.51; p<.001$) shown in Figure 1. The importance of the relationship between Docent

Insert Figure 1

instruction and Low Animal Familiarity to visitor Knowledge scores is verified when the test for mean differences is conducted (See Table 5). Detailed examination of the magnitude of the increase found in the Low Familiarity treatment between the Sign and the Docent treatments indicated that the main effect for Mode of Instruction (Docent > all others) may have been due exclusively to the changes experienced in the Low Familiarity animal group. Indeed, when the Low Familiarity data is removed from the analysis, the interaction effect disappears.

Insert Table 5

A further review of the interaction depicted in Figure 1 reveals other interesting effects. First, no single Mode of Instruction seems to be any more effective than the others where animals of High Familiarity are concerned.

Second, Medium Familiarity animals show a slightly different pattern. To begin with, Sign and Docent Knowledge score means do not differ significantly from one another. While neither Sign nor Docent treatments result in significantly higher scores when compared to the No-instruction group, they are significantly higher than the Normative group scores means.

As was found in High and Medium Familiarity groups, non-significant differences between Knowledge scores in No-instruction and Sign treatments exist for the Low Familiarity group. As was found for the Medium Familiarity group, a significant increase occurs between the Knowledge scores for Normative and Sign treatments. Unlike either the High or Medium Familiarity groups, the Knowledge scores of Low Familiarity participants rose significantly under Docent instruction. Indeed, there was no significant difference between the knowledge scores participants demonstrated for Low, Medium, or High Familiarity Animals under the Docent instruction.

Demographic and Attitudinal data were analysed to determine the relationship among the different variables measured and Knowledge scores. The intercorrelational matrix is found in Table 6.

The first major finding associated with these correlations was the highly predictive relationship between Knowledge and Attitude scores, as anticipated. However, the magnitude of the relationship was such that the

two variables could not be considered separately in subsequent analyses. Due to this high degree of colinearity, corresponding multiple regression analyses for Attitude and Knowledge scores as dependent variables showed identical solution sequences. No satisfactory regression analysis can be performed when collinearity exists to that extent. Therefore, it should suffice at this point to say that Attitude toward animals was highly predictive of Knowledge scores. Attitude was omitted from subsequent analyses.

Insert Table 6

Based on the significant correlations among the remaining variables, it can be inferred that in this study people visiting in smaller groups, who visit the zoo frequently and were zoo association members, scored higher on the Knowledge task. The only significant correlation related to the Ethnicity variable showed a Caucasian predominance among Zoo Association membership.

A stepwise forward multiple regression analysis was performed with Knowledge scores as the dependent variable to determine precisely which variables measured constituted the best predictors of Knowledge scores. The outcome showed that the two treatment variables, Animal Familiarity ($F(1,718)=224.59; R=.238; p<.0001$) and Mode of Instruction ($F(2,717)=62.68; R=.061; p<.0001$) were by far the most significant predictors and the greatest contributors to Knowledge scores. Visit Frequency affected Knowledge scores as well ($F(3,715)=16.49; R=.016; p<.001$). Ethnicity, Zoo Association Membership, and Group Size did not enter the regression as significant contributors (Table 7).

Finally, 91% of the visitors' inquiries to docents were animal-related.

Discussion

The relationship between Mode of Instruction and an individual's Knowledge scores appears to be obvious. The addition of signs to an exhibit and, subsequently, docents indicate that visitors learn more under these conditions. Similarly, it seems obvious that the more familiar a visitor is with an animal the more knowledge they will demonstrate about that animal. As anticipated, our data support these initial hypotheses.

However, in this study the simple relationship between Mode of Instruction and Knowledge scores was shown to be due exclusively to the changes experienced in the Low Familiarity animal group. The critical finding of this study involved the interactive effect that both Mode of Instruction and Level of Animal Familiarity have upon visitor knowledge.

Prior to zoo entry, scores vary significantly between all Levels of Familiarity with visitors scoring highest on those animals with which they are most familiar. While signs alone did not significantly raise visitor Knowledge scores, both the sign and viewing the exhibit resulted in significantly higher scores when compared to visitors' scores prior to zoo entry in Medium and Low Levels of Familiarity. When little or nothing is known about an animal, then, there appears to be an additive effect whereby visitors are gaining some information by viewing the exhibit (possibly having to do with the physical attributes of the animal) and additional information from having read the signs (more factual information).

Docents were found to have no significant impact upon visitor knowledge in High and Medium Familiarity groups. This may reflect previous visitor exposure to information about the basic living habits and characteristics of these animals through newspaper articles, television, or movies. Furthermore, it is important to remember that in this study

docents were asked to adhere to the content of the signs in giving their presentations. In limiting docents to sign content we may have perpetuated the same condition described by the sign versus no sign plateau. It is likely that where animals of Medium and High Familiarity levels are concerned, the public may benefit from more in-depth presentations.

Other possible explanations of why no difference in Knowledge scores was found for animals of High and Medium Familiarity Levels include the distracting qualities of the more salient animals, or an inability to hear the docent. Medium Familiarity animals occupied large exhibits that were always crowded. They tend to be popular, interactive exhibits. These explanations do not, however, apply to animals of High Familiarity. High Familiarity animals in this study were housed in a quiet "roundhouse" where the signs were posted directly in front of the exhibit and the area was relatively small (20' x 20'). Such a setting is ideal for instruction.

The insignificant rise in Knowledge scores under the Sign condition for animals of Low Level of Familiarity may have been the result of poor sign placement. These exhibits were large and visitors had to walk along a protruding arc. Signs were placed at one end of the exhibit. One might posit that visitors may not have noticed them. Again, however, this does not apply to the Medium Familiarity exhibits where the findings were similar.

What is clear is that docents have their greatest impact on visitors when their presentations are for animals of very low familiarity. The interactive qualities of the docent are felt by the authors to be of utmost value in generating interest in and drawing attention to animals generally ignored by the public. When setting up docent stations, zoos may want to focus on their unknown exotic species rather than those who have

been the subject of special television programs, books, or interest groups.

Attitude was found to be the best predictor of a visitor's knowledge score. This may reflect a greater amount of prior knowledge on the part of the visitor, or it may reflect a willingness to take advantage of learning opportunities. Since 84% of the sample visits the zoo approximately once every two or more years, the latter explanation seems more likely.

Visitors showed more support for the protection of animals when they were exposed to an exhibit with a sign than simply an exhibit alone. Docents had even a greater effect. It was expected that the successive modes of communication would increase the visitor's length of stay at an exhibit and contribute more to what they already knew about animals causing the person to value the animal more.

Highly familiar animals provoked predictably less desire to protect due to their commonality. Exotic animals about which the public has some knowledge received the highest scores for preservation. It is also sensible that animals about whom the public knows nothing, evoke little or no protective action in the public. These findings are consistent with the findings that a visitor's knowledge about an animal was the best predictor of their attitude. The implications for the zoo seem to be that they can effectively generate support for rather obscure species only if they inform the public about those species. Further, docent stations constitute a most effective way to accomplish this.

It is of interest, though not surprising, that GLAZA membership is a predictor of both knowledge and attitude scores for visitors. Typically, GLAZA members visit the zoo more often, donate money, participate in special activities, and receive an informative monthly newsletter as well

as a zoo magazine publication. This increased participation probably accounts for higher scores.

Finally, docents stationed at specified exhibits are hardly wasting their time according to this study. The bulk of the questions they were asked directly relate to the animal about which they were speaking so they were not being used simply to "direct traffic". Rather, the public appeared to make good use of a valuable resource.

A number of additional questions for further research need to be examined. For instance, subjects in this study are tested immediately upon leaving the exhibit. What effect does time (e.g., three to six to twelve weeks) have upon their scores? Subjects are also exposed to this information once. What effect would repetition have on their scores? As we have noted, in-depth presentations may be more appropriate for animals of certain familiarity levels. What would be the effect of presenting information to visitors of varying complexity?

Of even more importance is the question of the significance of a positive (or negative) attitude - does it in fact promote behaviors that support species preservation? Finally, involvement seems to affect attitudes. Can zoos make use of theories about ego-involvement as a mechanism for changing attitudes? Certainly, a number of questions remain to be examined as they apply to living museums.

Since the future of living museums relies upon their ability to develop support for the preservation of the species from which they obtained their collection, it is imperative that living museums generate a positive attitude on the part of the general public to preserve various species. The presence or absence alone of various instructional techniques is not necessarily the key issue in communicating this message to the

public, however. Rather, it is how institutions distribute their resources that is of major importance.

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Table 1

Newman-Kuels table of differences among animal means

	Raccoon	Badger	Chimpanzee	Polar Bear	Tapir	Cavy
$\bar{X}$	7.17	6.52	5.73	5.40	3.94	3.41
Raccoon		.65	1.44**	1.77**	3.23**	3.76**
Badger			.79*	1.12**	2.58**	3.11**
Chimp				.33	1.79**	2.32**
Bear					1.46**	1.99**
Tapir						.53

* $p < .05$ ** $p < .01$

Table 2
Means and Standard Deviations for
Two-Way Analysis of Vairiance

Modes of Instruction		Animal Familiarity		
		Low	Medium	High
Normative	Mean	2.03	4.67	6.15
	SD	2.72	2.33	2.17
No-Instruction	Mean	2.23	5.02	6.68
	SD	2.37	2.15	1.75
Sign Only	Mean	3.02	5.85	6.77
	SD	2.72	2.15	2.09
Docent	Mean	5.78	5.83	6.87
	SD	2.86	1.82	1.83

Table 3
Summary Table for
Two-Way Analysis of Variance
with Knowledge Scores

Source	Sums of Squares	df	MS	F
Total Variance	5651.95	359		
Modes of Instruction	361.85	3	120.62	11.48*
Animal Familiarity	1372.30	2	686.15	65.29*
Modes X Familiarity (Interaction)	259.37	6	43.23	4.11*
Error Variance	3658.43	348	10.51	

* $p < .001$

Table 4
Newman-Kuels tables for main effects
from Two-Way Analysis of Variance

Animal Familiarity			
	Low	Medium	High
Mean	3.26	5.34	6.62
Low		2.08**	3.36**
Medium			1.28**
High			

Modes of Instruction				
	Normative	No- Instruction	Sign	Docent
Mean	4.28	4.64	5.21	6.16
Normative		.36	.93**	1.88**
No- Instruction			.57*	1.53**
Sign Only				.95**
Docent				

* $p < .05$

** $p < .01$

Table 5
Newman-Kuels table for Interaction
from Two-Way Analysis of Variance

Mode of Instruction	Norm	No-In	Sign	Norm	No-In	Doc	Doc	Sign	Norm	No-In	Sign	Doc
Animal Familiarity	Low	Low	Low	Med	Med	Low	Med	Med	High	High	High	High
Sequence Number	1	2	3	4	5	6	7	8	9	10	11	12
Mean	2.03	2.23	3.20	4.67	5.02	5.78	5.83	5.85	6.15	6.68	6.77	6.87
1		.20	.99*	2.64**	2.99**	3.75**	3.80**	3.82**	4.12**	4.65**	4.74**	4.84**
2			.79	2.44**	2.79**	3.55**	3.60**	3.62**	3.92**	4.45**	4.54**	4.64**
3				1.65**	2.00**	2.76**	2.81**	2.83**	3.13**	3.66**	3.75**	3.85**
4					.35	1.11*	1.16*	1.18*	1.48**	2.01**	2.10**	2.20**
5						.76	.81	.83	1.13	1.66**	1.75**	1.85**
6							.05	.07	.37	.90	.99	1.09
7								.02	.32	.85	.94	1.04
8									.30	.83	.92	1.02
9										.53	.62	.72
10											.09	.19
11												.10

* $p < .05$

** $p < .01$

Table 6
Intercorrelation Matrix

	Knowledge	Attitude	Inst.	Fam.	Gp.Sz.	Ethnic	Visit
Attitude	.503**						
Instruction	.246**	.144**					
Familiarity	.488**	.227**	.003				
Group Size	-.068*	-.043	.108**	-.138**			
Ethnic	-.004	-.033	-.093**	-.057	.045		
Visit Freq.	.094**	.058	-.011	.019	-.008	-.056	
GLAZA Mem.	.094**	.027	-.083*	.023	-.102**	-.088**	.413**

* $p < .05$

** $p < .01$

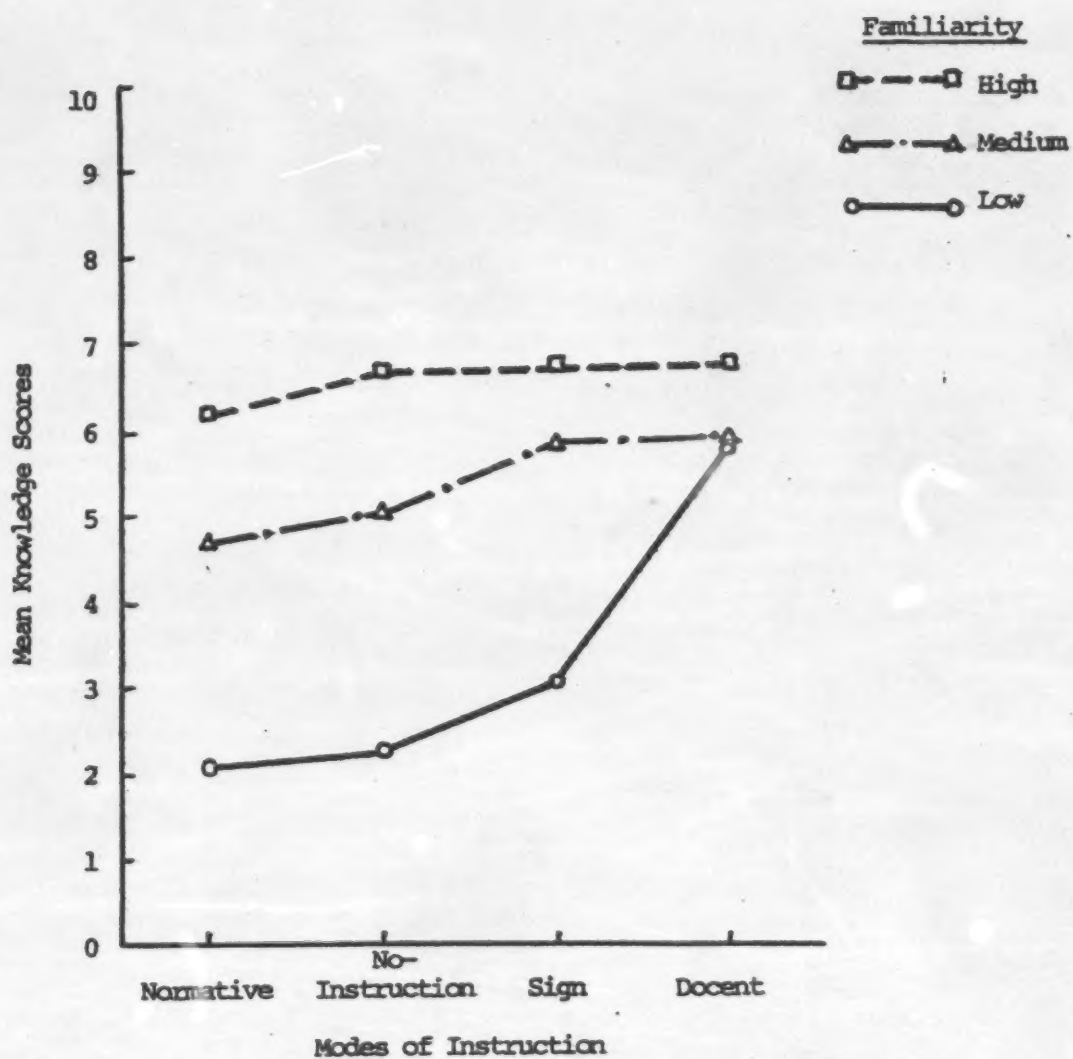


Figure 1. Graphic representation of the interaction between Modes of Instruction and Levels of Familiarity for Knowledge scores.